



MyD88 deficiency

MyD88 deficiency is an inherited disorder of the immune system (primary immunodeficiency). This primary immunodeficiency affects the innate immune response, which is the body's early, nonspecific response to foreign invaders (pathogens). MyD88 deficiency leads to abnormally frequent and severe infections by a subset of bacteria known as pyogenic bacteria. (Infection with pyogenic bacteria causes the production of pus.) However, affected individuals have normal resistance to other common bacteria, viruses, fungi, and parasites. The most common infections in MyD88 deficiency are caused by the *Streptococcus pneumoniae*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa* bacteria. Most people with this condition have their first bacterial infection before age 2, and the infections can be life-threatening in infancy and childhood. Infections become less frequent by about age 10.

Children with MyD88 deficiency develop invasive bacterial infections, which can involve the blood (septicemia), the membrane covering the brain and spinal cord (meningitis), or the joints (leading to inflammation and arthritis). Invasive infections can also cause areas of tissue breakdown and pus production (abscesses) on internal organs. In addition, affected individuals can have localized infections of the ears, nose, or throat. Although fever is a common reaction to bacterial infections, many people with MyD88 deficiency do not at first develop a high fever in response to these infections, even if the infection is severe.

Frequency

The prevalence of MyD88 deficiency is unknown. At least 24 affected individuals have been described in the medical literature.

Genetic Changes

MyD88 deficiency is caused by mutations in the *MYD88* gene, which provides instructions for making a protein that plays an important role in stimulating the immune system to respond to bacterial infection. The MyD88 protein is part of a signaling pathway that is involved in early recognition of pathogens and the initiation of inflammation to fight infection. This signaling pathway is part of the innate immune response.

Mutations in the *MYD88* gene lead to the production of a nonfunctional protein or no protein at all. The loss of functional MyD88 protein prevents the immune system from triggering inflammation in response to pathogens that would normally help fight the infections. Because the early immune response is insufficient, bacterial infections occur often and become severe and invasive.

Researchers suggest that as the immune system matures, other systems compensate for the loss of MyD88 protein, accounting for the improvement in the condition that occurs by adolescence.

Inheritance Pattern

This condition is inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene, but they typically do not show signs and symptoms of the condition.

Other Names for This Condition

- MYD88 deficiency
- pyogenic bacterial infections due to MyD88 deficiency

Diagnosis & Management

Genetic Testing

- Genetic Testing Registry: Myd88 deficiency
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C2677092/>

General Information from MedlinePlus

- Diagnostic Tests
<https://medlineplus.gov/diagnostictests.html>
- Drug Therapy
<https://medlineplus.gov/drugtherapy.html>
- Genetic Counseling
<https://medlineplus.gov/geneticcounseling.html>
- Palliative Care
<https://medlineplus.gov/palliativecare.html>
- Surgery and Rehabilitation
<https://medlineplus.gov/surgeryandrehabilitation.html>

Additional Information & Resources

MedlinePlus

- Encyclopedia: Immunodeficiency Disorders
<https://medlineplus.gov/ency/article/000818.htm>
- Encyclopedia: Meningitis
<https://medlineplus.gov/ency/article/000680.htm>

- Encyclopedia: Septicemia
<https://medlineplus.gov/ency/article/001355.htm>
- Health Topic: Immune System and Disorders
<https://medlineplus.gov/immunesystemanddisorders.html>

Genetic and Rare Diseases Information Center

- MYD88 deficiency
<https://rarediseases.info.nih.gov/diseases/12638/myd88-deficiency>

Additional NIH Resources

- National Institute of Allergy and Infectious Diseases
<https://www.niaid.nih.gov/diseases-conditions/primary-immune-deficiency-diseases-pids>

Educational Resources

- Disease InfoSearch: Myd88 deficiency
<http://www.diseaseinfosearch.org/Myd88+deficiency/8935>
- KidsHealth: Immune System
<http://kidshealth.org/en/parents/immune.html>
- MalaCards: myd88 deficiency
http://www.malacards.org/card/myd88_deficiency
- Orphanet: Pyogenic bacterial infections due to MyD88 deficiency
http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=183713

Patient Support and Advocacy Resources

- Immune Deficiency Foundation
<http://primaryimmune.org/about-primary-immunodeficiencies/specific-disease-types/innate-immune-defects/>
- International Patient Organisation for Primary Immunodeficiencies
<http://www.ipopi.org/>
- Jeffrey Modell Foundation
<http://www.info4pi.org/>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28MyD88+deficiency%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D>

OMIM

- MYD88 DEFICIENCY
<http://omim.org/entry/612260>

Sources for This Summary

- Maglione PJ, Simchoni N, Black S, Radigan L, Overbey JR, Bagiella E, Bussel JB, Bossuyt X, Casanova JL, Meyts I, Cerutti A, Picard C, Cunningham-Rundles C. IRAK-4 and MyD88 deficiencies impair IgM responses against T-independent bacterial antigens. *Blood*. 2014 Dec 4; 124(24):3561-71. doi: 10.1182/blood-2014-07-587824. Epub 2014 Oct 15.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/25320238>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4256908/>
- Picard C, Casanova JL, Puel A. Infectious diseases in patients with IRAK-4, MyD88, NEMO, or I κ B α deficiency. *Clin Microbiol Rev*. 2011 Jul;24(3):490-7. doi: 10.1128/CMR.00001-11. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/21734245>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3131061/>
- Picard C, von Bernuth H, Ghandil P, Chrabieh M, Levy O, Arkwright PD, McDonald D, Geha RS, Takada H, Krause JC, Creech CB, Ku CL, Ehl S, Maródi L, Al-Muhsen S, Al-Hajjar S, Al-Ghonaium A, Day-Good NK, Holland SM, Gallin JI, Chapel H, Speert DP, Rodriguez-Gallego C, Colino E, Garty BZ, Roifman C, Hara T, Yoshikawa H, Nonoyama S, Domachowske J, Issekutz AC, Tang M, Smart J, Zitnik SE, Hoarau C, Kumararatne DS, Thrasher AJ, Davies EG, Bethune C, Sirvent N, de Ricaud D, Camcioglu Y, Vasconcelos J, Guedes M, Vitor AB, Rodrigo C, Almazán F, Méndez M, Aróstegui JI, Alsina L, Fortuny C, Reichenbach J, Verbsky JW, Bossuyt X, Doffinger R, Abel L, Puel A, Casanova JL. Clinical features and outcome of patients with IRAK-4 and MyD88 deficiency. *Medicine (Baltimore)*. 2010 Nov;89(6):403-25. doi: 10.1097/MD.0b013e3181fd8ec3.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/21057262>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3103888/>
- Yamamoto T, Tsutsumi N, Tochio H, Ohnishi H, Kubota K, Kato Z, Shirakawa M, Kondo N. Functional assessment of the mutational effects of human IRAK4 and MyD88 genes. *Mol Immunol*. 2014 Mar;58(1):66-76. doi: 10.1016/j.molimm.2013.11.008. Epub 2013 Dec 5.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/24316379>
- von Bernuth H, Picard C, Jin Z, Pankla R, Xiao H, Ku CL, Chrabieh M, Mustapha IB, Ghandil P, Camcioglu Y, Vasconcelos J, Sirvent N, Guedes M, Vitor AB, Herrero-Mata MJ, Aróstegui JI, Rodrigo C, Alsina L, Ruiz-Ortiz E, Juan M, Fortuny C, Yagüe J, Antón J, Pascal M, Chang HH, Janniere L, Rose Y, Garty BZ, Chapel H, Issekutz A, Maródi L, Rodriguez-Gallego C, Banchereau J, Abel L, Li X, Chaussabel D, Puel A, Casanova JL. Pyogenic bacterial infections in humans with MyD88 deficiency. *Science*. 2008 Aug 1;321(5889):691-6. doi: 10.1126/science.1158298.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18669862>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2688396/>
- von Bernuth H, Picard C, Puel A, Casanova JL. Experimental and natural infections in MyD88- and IRAK-4-deficient mice and humans. *Eur J Immunol*. 2012 Dec;42(12):3126-35. doi: 10.1002/eji.201242683. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/23255009>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3752658/>

Reprinted from Genetics Home Reference:

<https://ghr.nlm.nih.gov/condition/myd88-deficiency>

Reviewed: June 2015
Published: March 21, 2017

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services